

DECEMBER 4.

Mr. CHARLES MORRIS in the chair.

Twenty-five persons present.

*Theories of the Formation of Coral Islands.*—Mr. CHARLES MORRIS remarked that there exist, as is well known, two theories of the formation of coral islands, the subsidence theory of Charles Darwin, and the recent theory propounded by John Murray and others, which claims that the phenomena can be explained without calling in the aid of subsidence. It was not his purpose to offer any argument on this controverted question, and he would simply say that the Darwin theory seemed to him much the most probable, the objections to it being, in his view of the case, far less cogent than those to the Murray theory.

If the subsidence theory were accepted, however, there was one consequence necessarily deducible from it which, so far as he was aware, had not yet been definitely considered, and which was not without scientific importance.

The area occupied by coral islands in the Pacific is, as stated by Dana, 6000 miles in length and from 2000 to 2500 miles in width, thus covering from 12,000,000 to 15,000,000 square miles. This includes a blank central area of 1,000,000 square miles in which the subsidence is supposed to have been too rapid to permit coral growth, beyond which is a region of small atolls, and outside this the region of ordinary atolls. Outside this again is a region in which barrier and fringing reefs replace atolls, and if this region be included the total area of subsidence must have been, according to Le Conte, about 20,000,000 square miles.

The depth of subsidence is variously stated. Dana considers that the extreme subsidence was at least 9000 or 10,000 feet. Later authorities give it at about three miles. As regards the average subsidence of the whole area it may perhaps be safely assumed as not less than 5000 feet, possibly considerably more. If the Darwin subsidence theory be accepted, then, an area of sea bottom equal to that of the largest continent must have sunk bodily to a depth of at least a mile.

This subsidence may have been correlative with a considerable elevation of the land surface, but there is no reason to believe that there was any equal elevation of other portions of the ocean bed. There are many evidences of local elevation, but all of them taken together are unimportant as compared with the great subsidence over the coral island area, and may have been balanced by local subsidence elsewhere. Yet such an immense subsidence, with no corresponding elevation of the ocean bottom, could not take place without adding greatly to the capacity of the ocean basin. It formed what we may speak of as a huge valley in the ocean bed, of 20,000,000

square miles in area and one mile in average depth. The filling of such a valley with water must necessarily have caused a marked lowering of the general ocean level. If the figures above given be assumed as correct it is easy to calculate the amount of depression of sea level.

The area in question is equal to that of Asia and Europe combined, and the effect of its sinking would be equivalent to that of the sinking of the Eurasian continent till covered with water to the average depth of one mile; since to fill such a valley in the ocean bed would require as much water as to cover a continent sinking to the same depth. The area named is very nearly one seventh of the whole ocean area, and to fill it to a depth of one mile would cause a general oceanic depression of one-seventh of this depth, or about 750 feet. If the average subsidence be taken at a somewhat greater figure, say 7000 feet, the consequence would be a depression of the ocean level of 1000 feet.

This is no fanciful conclusion. If the subsidence stated really took place, without important elevation of the ocean bed elsewhere, such a lowering of the general ocean level must necessarily have occurred to an extent governed by the average extent of subsidence. The effect on the relations of land and ocean altitude would be equivalent to an elevation of the whole land surface of the earth to a height of 750 or 1000 feet, or some other height dependant on the real degree of subsidence.

Such an effect must have left its marks, in the exposure of considerable areas of new land along sloping shores, in the draining of bays and estuaries, the possible conversion of bays into partly or fully land-locked seas, and other drainage results. In fact if such a virtual elevation of all the shore regions of the earth took place it would seem as if it must have left some generally traceable indications, which would furnish an argument in favor of the subsidence theory. Yet it may have been so complicated with actual elevations and depressions of the land surface as to destroy evidences of its existence in most localities. That land drainage and shore elevation did take place to a considerable extent during the Tertiary epoch is acknowledged, but whether these were due to actual elevation, or to a sinking of the ocean level, is a problem which cannot be definitely solved without much fuller evidence than we possess at present.

The following was ordered to be printed:—